

# The Builder.

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## OUR NEW VOLUME.—THE EXHIBITION BUILDING IN HYDE PARK.

**I**NSTEAD of the pledges with which we have usually commenced each new volume of our Journal, we, on the present occasion, begin with performance. **THE BUILDER** is enlarged from sixteen to twenty-four pages, the price remaining the same; and we present to our readers, in addition to our usual illustrations, a large-sized view of the inside of the enormous structure raised in Hyde Park for the International Exhibition of Industry. It will be our constant and earnest endeavour to render this Journal equal to its purpose: we shall strive zealously to prove ourselves worthy of the confidence which the public have heretofore placed in us, and the favours we have received: and if honesty of purpose, love of truth, kind feeling, and a firm determination to follow what may seem to us the right course, will suffice to effect this, we may venture to anticipate success. We ask, as we have often done before, for the co-operation and sympathy of our readers, confidence in our good intentions, consideration for our short-comings. Although forced occasionally, in discharge of our office, to contravene the opinions of others and animadvert on their proceedings, we would never willingly hurt the feelings of any. We see no reason why, if we are forced to differ with individuals in special questions of taste, judgment, or even propriety, that we should be viewed in all things as an enemy. We have no pleasure in giving pain, and infinitely prefer smiling countenances and a shake of the hand to black looks and spiteful recriminations: but we have a duty to the public to discharge which over-rides all other considerations. *This duty we shall do*; but we will endeavour to do it fairly and kindly. We are not bound to say on every occasion all we think, but we pledge ourselves to think all we say. And so with warm and hearty thanks to many friends, and referring to the introductions to former volumes of the journal for our views of its scope and claims, we leave this part of the subject, saying, with *Hamlet's* player,—

"For us and our miscellany,  
Here stooping to your clemency,  
We beg your hearing patiently."

The interior view we have given of the Exhibition Building represents it as it will appear looking towards the east, and given some idea of the extraordinary length of the structure, 1,848 feet, and of its general construction.\* The hemispherical roof of the transept is seen above the flat roof of the nave: the columns piled on columns, the "ridge and furrow" roof, and the girders carrying both that and the galleries, are clearly represented. The floors of the galleries, it will be seen, are level with the top of the girders

(not as shown in the prints which have been published), and have a light iron railing as a protection for the visitors. We have introduced some few figures and articles of manufacture, to serve as a scale (a fountain, also, as there will be several).—but the view does not pretend to show the structure as it will appear when furnished: the aisles will then be separated, as most of our readers know, by tapestry, carpets, or hangings of other sort, suspended between the columns, and there will be an "embarrassment of riches," which we may not attempt to fore-show.

The correctness with which all the 2,500 columns have been placed is very striking. Regularity has been secured, and the task of construction simplified, by making all parts of the plan multiples of one small manageable figure. A perfect fit is thus secured with much greater ease, while the repetition of the same dimensions renders confusion or complexity impossible. This is the case with all the great iron roofs of railway stations recently constructed. All the dimensions of the Building in the park are multiples of 6: for instance, the width and height of the smallest aisle is 3 times 9, or 24 feet; of the second largest aisle, the width is 6 times 4, or 24 feet; and of the great centre aisle, 72 feet, or 9 times 8. The whole width is 404 feet.

The side aisles look low, but still are high enough for their purpose.

The effect of the transept is very striking.—we may even say grand: the full-grown elms, put under a hand-glass, are dwarfed into insignificance: it may safely be pronounced the most daring and extraordinary piece of construction ever attempted. The span is 73 feet: the roof is a semicircle with a radius, therefore, of half that dimension: it is 404 feet long, and is, at the crown, 104 feet from the floor. Only those who saw on the ground the semicircular wooden ribs which are the main stay of this roof, will properly estimate their size and construction.† It was no ordinary feat to

raise these enormous ribs whole from the ground into their places.‡ Horizontal tie-beams are placed at a level about 20 feet above the springing, and diagonal ties are introduced throughout the roof.§

Machinery has necessarily been resorted to in every stage of the business to facilitate progress: the arrangement for cutting off the ends of the wooden gutters and making a further hollow at the end to receive the castings to discharge the drip-water,|| for splicing

to the face of the plane. At the distance of 3 feet from the point of contact between the curve and the straight edge of the plane, which occurs in the middle of its length, the distance, or distance of the curve from the straight line, is 1.51 inch, and at either end of the plane, supposing it to be 12 feet long, it is 7.2 inches. By means of the template the curvature is accurately obtained at all intermediate points, and it is then cut out on a plane, or cylindrical roof of any species might be constructed in a similar manner, only, as the radius of curvature in all curves is not constant, except in the circle, but varies continually from point to point of the curve, a set of different templates would be necessary to make the different segments of the arch. The curved piece cut off from the plank on the one side is added on the other, and the circular arc which now bounds the figure towards the interior undergoes a slight alteration, to adapt it to a second template, which exactly gives the curvature of the inner circle. Wooden disks, or pins, are used to connect the two parts of which each segment is built, and the strong combination which results is completed by cutting off the ends according to the main drawn curve. The entire rib is built of two layers of two-inch thick segments, formed in the above manner with a layer of four-inch thick segments interposed between them. All these being accurately portions of the circle, no great difficulty attends their union, because, when put together, they exactly make up a circular arc in this way.—A layer of the two-inch segments, making up the whole semicircle, with its terminal extensions, is first put together upon the ground, and forms, in fact, a rib of the same pattern as the completed rib, only two inches in the knees instead of eight. Upon this layer of segments, the layer of four-inch segments is laid, in such a manner as to "break joints" with it; that is to say, each joint or break in the four-inch course, falls upon the centre of one of the segments in the two-inch layer, and vice versa. Another layer of two-inch segments is imposed upon the upper side of the layer of four inches, which is, in fact, included between the two. The joints of the two four-inch courses of segments would exactly correspond with each other, if nothing were interposed between them, and both of them, consequently, break joints, with the intermediate four-inch course. As three courses being exactly put together in their respective places, are "spiked" or nailed together with long nails, and thus united in one rigid mass, which it is obvious could not have been made in the first instance from eight-inch timber.

\* Three were raised upon end and set up in pairs with pulleys fitted in, distance-pieces to support the intermediate girders, and on sets of cross-bracing to make the ribs sufficiently stiff. Ropes were then attached to this framework from scaffolding on either side of the transept, at the point of intersection with the centre aisle, and the pressure used in raising the ribs was equal to that of cranes. As supposed that the men working them could see exactly the extent to which the ribs added to their ends should be pulled. As the framework was necessarily broader than the transept, one side was raised about 36 feet higher than the other, and the whole was raised to the desired elevation. It was then moved on rollers to its proper position in the arch, and dropped into the socket 4 feet deep, formed for its reception at the top of each cast-iron column in that part of the third tier.

† Mr. Henderson originally suggested the construction of the transept. Mr. Barry proposed the hemispherical roof.

‡ The apparatus for this purpose consists principally of a circular saw, about 36 inches in diameter, about the centre of which curved cutters of peculiar form are arranged with their edges disposed in a manner to cut in the same direction as the saw. An axle mounted upon a heavy mass of wood and iron, carries the saw, and also a small drum, about which an endless strap is passed, proceeding from a larger drum concentric with the 6-wheel of a stationary horse steam-engine. The mass upon which the saw axle is mounted is supported by a strong chain passing over a wheel, and nearly counterbalanced on the other side by a weight. On the under side it is connected with a lever, one end of which is fixed to the upright which carry the wheel and apparatus, and the other stands forward to be worked by the operative. In front of the plane of the saw, at a convenient level, is a level table, and exactly distant from the same plane by the required length of each gutter, a shoe or box of iron open towards the saw, and provided with a lid which can be fastened down, as secured to a block on the table. Midway between the shoe and the plane of the saw, a scratch is fixed about 4 inches above the table, capable of swinging completely round on a pivot. Into this scratch the gutter is put, and sloped round until one end drops into the shoe, against the end of which it is thrust home, when the lid is brought down and fastened. The other end of the gutter, near the saw, is now forced down against a rest by a man in attendance, and it will be observed, that as he

\* The following description of these ribs has been given in the *Morning Advertiser*.—"The principal part of each rib is of a semicircular form, with an internal radius of 36.7 feet, and an external one of 37.7 feet. Both ends of the semicircle are produced into straight lines, coinciding with the tangents there, that is, parallel to the vertical line when the rib is placed erect in its natural position. The length of these rectilinear extensions of the ribs is 8 feet, and the intention of the addition thus made to the circular part is to enable the rib to fit exactly into corresponding extensions of the higher columns upwards, which are formed in the casting. Transversely, that is, in the plane of the axis of the roof, the section is 1 foot wide, measured along the radius, by 8 inches deep, with small additions at either end, indicating the course of exterior and interior binding pieces. This latter section exhibits the whole structure of the rib, which may be thus described:—pine planks of 4 inches and 3 inches in thickness are the only materials out of which the body of the ribs is made. These planks are cut to the exact thickness and width in the sawmill, and an aliquot part of the whole length of the rib in length, which slightly exceeds 124 feet, measured along the back. The length of each piece is about 12 feet, for reasons which will presently appear, depending on the curvature of the roof. When the straight piece has been got out of the proper dimensions, it becomes necessary to convert it into the segment of an annulus, or figure of the same form and dimension as the rib itself. This is accomplished in a very simple manner, and with economy of material. A 'template,' or plate of metal, worked up in the exact pattern required, is laid upon the wood, and adjusted to the situation which the corresponding part of the roof would occupy, were it placed evenly upon a succession of similar planks, arranged in the manner of a polygon about the centre. The pencil is then carried round the convex circular edge of the template, and a saw-cut made along the mark perpendicularly

\* For exterior view, plan, and descriptive particulars, see our former Volume, VIII.